



Ottawa Hull K1A 0C9

(21) (A1) 2,103,470  
(22) 1993/11/18  
(43) 1994/08/05

(51) INTL.CL.<sup>5</sup> B27K-003/32

(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Remedial Wood Preservative

(72) West, Michael H. - U.S.A. ;

(71) Same as inventor

(30) (US) 08/013,433 1993/02/04

(57) 2 Claims

5,090,5/26

Notice: This application is as filed and may therefore contain an incomplete specification.



Industrie Canada Industry Canada

3488

Canada

## ABSTRACT OF THE DISCLOSURE

A remedial wood preservative paste combination containing one to six parts of metallic copper, derived from amine-inorganic copper complexes, combined with sodium borate, sodium fluoride, or a combination thereof, in a ratio of two to forty parts of sodium salt for each part of metallic copper in the composition.

This invention relates to compositions for the supplemental or remedial treatment of wood in place.

Utility poles and railroad cross ties are normally pressure treated with toxic preservative compositions e.g. creosote or pentachlorophenol dissolved in oil. These toxic ingredients penetrate thru most of the sapwood portion of the article. On an average these pressure treated commodities last for 30 years without supplementary treatments.

Supplementary or remedial treatments can be used to materially increase the useful life of poles and ties. Poles show early failure due to light or shallow treatment, failure to destroy internal decay organisms present in the pole at the time of pressure treatment, checking or cracking which allows entry of either decay or insects into untreated heartwood, and/or leaching of the preservative from the critical groundline area. Ties most often are attacked under the tie plate due to entry of deterioration organisms into the untreated heartwood thru the spike holes and due to moist conditions under the plate.

Remedial treatments are made to ties by application under the plate. Poles are remedially treated with a 2 1/2 inch paste bandage at and below the groundline, or with a paste, rod, or liquid in holes drilled as close as possible to areas of suspected deterioration.

Historically ties and poles have been remedially treated with

paste compositions containing creosote, pentachlorophenol, sodium borate, and/or sodium fluoride. Liquid and solid fumigants have been used for treating poles. Remedial wood preservatives containing copper naphthenate, with sodium borate or sodium fluoride are now finding favor in replacing more hazardous paste compositions containing creosote and pentachlorophenol.

Since copper naphthenate is very odiferous, working with the paste is unpleasant, and wood treated with it has an unpleasant odor. Compositions of the current invention do not possess this unpleasant naphthenic odor.

It is desirable that remedial preservative chemicals move quickly from the area of application to the area of infection to quickly kill the attacking organism and prevent strength loss in the pole or tie. It is also desirable that one or more of the preservative chemicals fix in the wood to prevent repeat infections.

Sodium borate and sodium fluoride diffuse quickly thru moist wood, but they are not fixed in the wood. They continue to move with the water in the wood until they finally leach from the pole or tie. Creosote, pentachlorophenol, and copper naphthenate all fix fairly well once they penetrate the wood. However, they do not move quickly thru moist wood. Copper from compositions of the current invention moves quickly thru moist wood. This is a cornerstone of the present invention.

Copper is known to fix to wood by hydrogen bonding with the cellulose. Amine-inorganic copper complexes, when blended into paste compositions with sodium borate and/or sodium fluoride, penetrate quickly into moist wood. It appears that the combination

With sodium borate and/or sodium fluoride results in swifter penetration of the amine-inorganic copper complex.

This invention relates to a paste composition for remedial treatment of wood having particular use for diffusing quickly from the application site to the infection site. More particularly, it comprises a paste composition containing amine-inorganic copper complexes with sodium borate and/or sodium fluoride. All active components quickly move from application site to infection site.

The compositions comprise a paste formed by mixing sodium borate and/or sodium fluoride with an inorganic copper complex in water and adding various paste forming materials e.g. clays, fatty acids, etc. until a formulation of suitable rheology for the particular remedial application is achieved.

Remedial application to poles is achieved by filling holes drilled in the pole with the paste of the current invention or by applying the paste to the surface of the pole. If the paste is applied to the surface, it should be wrapped with plastic, coated paper, or other suitable material to prevent physical removal of the pesticide before it diffuses into the pole. Ties are remedially treated with the paste of the current invention by placing the paste under the tie plate.

Sodium borate and sodium fluoride are well known remedial wood preservatives. U.S. patent no. 5,078,912 discloses the use of amine-inorganic copper complexes for preserving solid wood when said complexes are diluted from about 1 to 5 percent in water and applied by pressure treatment. No reference is made for their utility in a

concentrate paste for diffusion into moist wood or for the increase in speed of penetration when they are combined with sodium borate and/or sodium fluoride. Finally, no claim is made for their utility as remedial preservatives.

Methods for preparing amine-inorganic copper complexes may be found in U.S. patent no. 4,098,602. Inorganic copper materials I have found suitable for the practice of the current invention include copper-hydroxide, basic copper carbonate, and copper sulfate. Amines I have found suitable include monoethanolamine, monoisopropanolamine, and triethanolamine. There is only one chemical form of sodium fluoride. The sodium borate preferred is sodium tetraborate decahydrate. Paste forming materials I have found useful include clays e.g. ATTAGEL<sup>TM</sup> 350 marketed by the Englehard Corporation.

The following examples illustrate the compositions, remedial applications, and swift movement of the active ingredients thru moist wood when it is treated according to the instant invention.

#### EXAMPLE 1

A paste formulation was prepared by blending together thirty-three pounds of water, three and one-half pounds of copper hydroxide, six pounds of monoethanolamine, forty pounds of sodium tetraborate decahydrate, and seventeen and one-half pounds of ATTAGEL<sup>TM</sup> 350 clay to yield a material containing two percent copper as the metal.

The paste formed was applied to 21 inches of the groundline section of a pine pole to a thickness of one-half inch and the treated section was wrapped with nylon film sheet. After two weeks

borings were taken from the treated section of the pole. It was determined by analytical testing that both borax and copper had penetrated into the part of the boring one-half inch from the surface.

#### EXAMPLE 2

A paste formulation was prepared by blending together twenty-five pounds of water, seven pounds of basic copper carbonate, fifteen pounds of monoisopropanolamine, forty pounds of sodium fluoride, and thirteen pounds of ATTAGEL<sub>TM</sub> 350 to yield a product containing four percent copper as the metal.

The paste formed was pushed into one-fourth inch holes drilled six inches deep into a pine pole. After two weeks borings were taken one-half inch distant from the edge of the holes. It was determined by analytical testing that both copper and sodium fluoride had penetrated into these borings.

#### EXAMPLE 3

A paste formulation was prepared by blending together thirty-five pounds of water, four pounds of copper sulfate pentahydrate, six pounds of triethanolamine, twenty pounds of sodium tetraborate decahydrate, twenty pounds of sodium fluoride, and fifteen pounds of ATTAGEL<sub>TM</sub> 350 clay to yield a remedial preservative containing one-percent copper as the metal.

The paste formed was brushed to one-fourth inch thickness on an aged cross tie. A tie plate was placed over the preservative. After two weeks borings were taken from under the tie plate. It

2103470

was determined by analytical testing that copper, borax, and sodium fluoride had all penetrated into the part of the boring one-half inch from the surface.

#### EXAMPLE 4

A formulation was prepared by blending together twenty-three pounds of water, three and one-half pounds copper hydroxide, ten pounds of monoethanolamine, forty pounds of sodium tetraborate decahydrate, fifteen pounds of tall oil fatty acids, and eight and one-half pounds of ATTAGEL<sup>TM</sup> 350 clay yielding a paste containing two percent copper as the metal.

The paste formed was applied to 21 inches of the groundline section of a pine pole to a thickness of one-eighth inch and the treated section was wrapped with polyethylene coated kraft paper. After two weeks borings were taken from the treated section of the pole. It was determined by analytical testing that both borax and copper had penetrated into the part of the boring one-half inch from the surface.

#### EXAMPLE 5

A formulation was prepared by blending together thirty pounds of water, ten and one-half pounds of copper hydroxide, nineteen and one-half pounds of diethanolamine, ten pounds of sodium tetraborate decahydrate, and thirty pounds of ATTAGEL<sup>TM</sup> 350 to form a paste containing six percent copper as the metal.



2103470

The paste was brushed to one-half inch thickness on an aged cross tie. A tie plate was placed over the remedial preservative. After two weeks borings were taken from under the tie plate. It was determined by analytical testing that copper and borax had both penetrated into the part of the boring one-half inch from the surface.

EXAMPLE 6

A formulation was prepared using a special sodium borate marketed under the trade mark TIMBOR<sup>TM</sup> by U S Borax. This product with the approximate composition disodium octaborate tetrahydrate, is reputed to be a combination of sodium tetraborate and boric acid.

Forty-five pounds of water, three and one-half pounds of copper hydroxide, fifteen pounds of monoethanolamine, twenty-two pounds of TIMBOR<sup>TM</sup> and fourteen and one-half pounds of ATTAGEL<sup>TM</sup> 350 were blended together and allowed to sit for twenty four hours. The paste was applied to freshly cut and peeled elm stubs to a one-fourth inch thickness. After three days the copper had visably moved up the stubs as much as six inches from the site of application.

2103470

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A remedial wood preservative paste combination containing one to six parts of metallic copper, derived from amine-inorganic copper complexes, combined with sodium borate, sodium fluoride, or a combination thereof, in a ratio of two to forty parts of sodium salt for each part of metallic copper in the composition.
2. A method of achieving swift and extensive penetration, by diffusion, of copper in wood by applying to said wood alkanolamine-inorganic copper complexes in combination with sodium borate, sodium fluoride, or a combination thereof, in a ratio of two to forty parts of sodium salt for each part of metallic copper in the composition.

**SUBSTITUTE**  
***REMPLACEMENT***

**SECTION is not Present**  
***Cette Section est Absente***

## ABSTRACT OF THE DISCLOSURE

A remedial wood preservative paste combination containing one to six parts of metallic copper, derived from amine-inorganic copper complexes, combined with sodium borate, sodium fluoride, or a combination thereof, in a ratio of two to forty parts of sodium salt for each part of metallic copper in the composition.

This invention relates to compositions for the supplemental or remedial treatment of wood in place.

Utility poles and railroad cross ties are normally pressure treated with toxic preservative compositions e.g. creosote or pentachlorophenol dissolved in oil. These toxic ingredients penetrate thru most of the sapwood portion of the article. On an average these pressure treated commodities last for 30 years without supplementary treatments.

Supplementary or remedial treatments can be used to materially increase the useful life of poles and ties. Poles show early failure due to light or shallow treatment, failure to destroy internal decay organisms present in the pole at the time of pressure treatment, checking or cracking which allows entry of either decay or insects into untreated heartwood, and/or leaching of the preservative from the critical groundline area. Ties most often are attacked under the tie plate due to entry of deterioration organisms into the untreated heartwood thru the spike holes and due to moist conditions under the plate.

Remedial treatments are made to ties by application under the plate. Poles are remedially treated with a 21 inch paste bandage at and below the groundline, or with a paste, rod, or liquid in holes drilled as close as possible to areas of suspected deterioration.

Historically ties and poles have been remedially treated with

paste compositions containing creosote, pentachlorophenol, sodium borate, and/or sodium fluoride. Liquid and solid fumigants have been used for treating poles. Remedial wood preservatives containing copper naphthenate, with sodium borate or sodium fluoride are now finding favor in replacing more hazardous paste compositions containing creosote and pentachlorophenol.

Since copper naphthenate is very odiferous, working with the paste is unpleasant, and wood treated with it has an unpleasant odor. Compositions of the current invention do not possess this unpleasant naphthenic odor.

It is desirable that remedial preservative chemicals move quickly from the area of application to the area of infection to quickly kill the attacking organism and prevent strength loss in the pole or tie. It is also desirable that one or more of the preservative chemicals fix in the wood to prevent repeat infections.

Sodium borate and sodium fluoride diffuse quickly thru moist wood, but they are not fixed in the wood. They continue to move with the water in the wood until they finally leach from the pole or tie. Creosote, pentachlorophenol, and copper naphthenate all fix fairly well once they penetrate the wood. However, they do not move quickly thru moist wood. Copper from compositions of the current invention moves quickly thru moist wood. This is a cornerstone of the present invention.

Copper is known to fix to wood by hydrogen bonding with the cellulose. Amine-inorganic copper complexes, when blended into paste compositions with sodium borate and/or sodium fluoride, penetrate quickly into moist wood. It appears that the combination

With sodium borate and/or sodium fluoride results in swifter penetration of the amine-inorganic copper complex.

This invention relates to a paste composition for remedial treatment of wood having particular use for diffusing quickly from the application site to the infection site. More particularly, it comprises a paste composition containing amine-inorganic copper complexes with sodium borate and/or sodium fluoride. All active components quickly move from application site to infection site.

The compositions comprise a paste formed by mixing sodium borate and/or sodium fluoride with an inorganic copper complex in water and adding various paste forming materials e.g. clays, fatty acids, etc. until a formulation of suitable rheology for the particular remedial application is achieved.

Remedial application to poles is achieved by filling holes drilled in the pole with the paste of the current invention or by applying the paste to the surface of the pole. If the paste is applied to the surface, it should be wrapped with plastic, coated paper, or other suitable material to prevent physical removal of the pesticide before it diffuses into the pole. Ties are remedially treated with the paste of the current invention by placing the paste under the tie plate.

Sodium borate and sodium fluoride are well known remedial wood preservatives. U.S. patent no. 5,078,912 discloses the use of amine-inorganic copper complexes for preserving solid wood when said complexes are diluted from about 1 to 5 percent in water and applied by pressure treatment. No reference is made for their utility in a

concentrate paste for diffusion into moist wood or for the increase in speed of penetration when they are combined with sodium borate and/or sodium fluoride. Finally, no claim is made for their utility as remedial preservatives.

Methods for preparing amine-inorganic copper complexes may be found in U.S. patent no. 4,098,602. Inorganic copper materials I have found suitable for the practice of the current invention include copper-hydroxide, basic copper carbonate, and copper sulfate. Amines I have found suitable include monoethanolamine, monoisopropanolamine, and triethanolamine. There is only one chemical form of sodium fluoride. The sodium borate preferred is sodium tetraborate decahydrate. Paste forming materials I have found useful include clays e.g. ATTAGEL<sub>TM</sub> 350 marketed by the Englehard Corporation.

The following examples illustrate the compositions, remedial applications, and swift movement of the active ingredients thru moist wood when it is treated according to the instant invention.

#### EXAMPLE 1

A paste formulation was prepared by blending together thirty-three pounds of water, three and one-half pounds of copper hydroxide, six pounds of monoethanolamine, forty pounds of sodium tetraborate decahydrate, and seventeen and one-half pounds of ATTAGEL<sub>TM</sub> 350 clay to yield a material containing two percent copper as the metal.

The paste formed was applied to 21 inches of the groundline section of a pine pole to a thickness of one-half inch and the treated section was wrapped with nylon film sheet. After two weeks



borings were taken from the treated section of the pole. It was determined by analytical testing that both borax and copper had penetrated into the part of the boring one-half inch from the surface.

## EXAMPLE 2

A paste formulation was prepared by blending together twenty-five pounds of water, seven pounds of basic copper carbonate, fifteen pounds of monoisopropanolamine, forty pounds of sodium fluoride, and thirteen pounds of ATTAGEL<sup>TM</sup> 350 to yield a product containing four percent copper as the metal.

The paste formed was pushed into one-fourth inch holes drilled six inches deep into a pine pole. After two weeks borings were taken one-half inch distant from the edge of the holes. It was determined by analytical testing that both copper and sodium fluoride had penetrated into these borings.

## EXAMPLE 3

A paste formulation was prepared by blending together thirty-five pounds of water, four pounds of copper sulfate pentahydrate, six pounds of triethanolamine, twenty pounds of sodium tetraborate decahydrate, twenty pounds of sodium fluoride, and fifteen pounds of ATTAGEL<sup>TM</sup> 350 clay to yield a remedial preservative containing one-percent copper as the metal.

The paste formed was brushed to one-fourth inch thickness on an aged cross tie. A tie plate was placed over the preservative. After two weeks borings were taken from under the tie plate. It

2103470

was determined by analytical testing that copper, borax, and sodium fluoride had all penetrated into the part of the boring one-half inch from the surface.

#### EXAMPLE 4

A formulation was prepared by blending together twenty-three pounds of water, three and one-half pounds copper hydroxide, ten pounds of monoethanolamine, forty pounds of sodium tetraborate decahydrate, fifteen pounds of tall oil fatty acids, and eight and one-half pounds of ATTAGEL<sup>TM</sup> 350 clay yielding a paste containing two percent copper as the metal.

The paste formed was applied to 21 inches of the groundline section of a pine pole to a thickness of one-eighth inch and the treated section was wrapped with polyethylene coated kraft paper. After two weeks borings were taken from the treated section of the pole. It was determined by analytical testing that both borax and copper had penetrated into the part of the boring one-half inch from the surface.

#### EXAMPLE 5

A formulation was prepared by blending together thirty pounds of water, ten and one-half pounds of copper hydroxide, nineteen and one-half pounds of diethanolamine, ten pounds of sodium tetraborate decahydrate, and thirty pounds of ATTAGEL<sup>TM</sup> 350 to form a paste containing six percent copper as the metal.

2103470

The paste was brushed to one-half inch thickness on an aged cross tie. A tie plate was placed over the remedial preservative. After two weeks borings were taken from under the tie plate. It was determined by analytical testing that copper and borax had both penetrated into the part of the boring one-half inch from the surface.

#### EXAMPLE 6

A formulation was prepared using a special sodium borate marketed under the trade mark TIMBOR<sub>TM</sub> by U S Borax. This product with the approximate composition disodium octaborate tetrahydrate, is reputed to be a combination of sodium tetraborate and boric acid.

Forty-five pounds of water, three and one-half pounds of copper hydroxide, fifteen pounds of monoethanolamine, twenty-two pounds of TIMBOR<sub>TM</sub> and fourteen and one-half pounds of ATTAGEL<sub>TM</sub> 350 were blended together and allowed to sit for twenty four hours. The paste was applied to freshly cut and peeled elm stubs to a one-fourth inch thickness. After three days the copper had visably moved up the stubs as much as six inches from the site of application.

2103470

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A remedial wood preservative paste combination containing one to six parts of metallic copper, derived from amine-inorganic copper complexes, combined with sodium borate, sodium fluoride, or a combination thereof, in a ratio of two to forty parts of sodium salt for each part of metallic copper in the composition.
2. A method of achieving swift and extensive penetration, by diffusion, of copper in wood by applying to said wood alkanolamine-inorganic copper complexes in combination with sodium borate, sodium fluoride, or a combination thereof, in a ratio of two to forty parts of sodium salt for each part of metallic copper in the composition.

**SUBSTITUTE**  
***REMPLACEMENT***

**SECTION is not Present**  
***Cette Section est Absente***